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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/603,976	06/25/2003	Jong Goo Jung	30205/39380	3741
4743	7590	01/06/2005	EXAMINER	
MARSHALL, GERSTEIN & BORUN LLP 6300 SEARS TOWER 233 S. WACKER DRIVE CHICAGO, IL 60606			SMOOT, STEPHEN W	
			ART UNIT	PAPER NUMBER
			2813	

DATE MAILED: 01/06/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/603,976

Applicant(s)

JUNG ET AL.

Examiner

Stephen W. Smoot

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 October 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-4 and 7-22 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-4 and 7-22 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 June 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>9-21-04</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

This Office action is in response to applicant's amendment received on 18 October 2004.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-4, 7-14 are rejected under 35 U.S.C. 102(b) as being anticipated by Shemo et al. (US 6,328,774 B1).

Referring to the abstract and column 4, line 51 to column 9, line 49, Shemo et al. disclose an aqueous polishing composition with abrasive that includes a periodate that can be periodic acid (HIO₄) preferably added in an amount ranging from 0.1 to 5 weight % (see column 6, lines 3-6). The abrasive can be colloidal silica with a preferred particle size that ranges from 0.01 to 0.2 µm (i.e. 10 to 200 nm) (see column 5, lines 32-35). Alternatively, aluminum oxide and cerium oxide can be used as the abrasive (see

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column 4, lines 52-61). The composition can also contain a buffer component to adjust the pH to be within the preferred range of 2 to 5. In example 10 of Table 1, a polishing composition with 7.5 g/l of periodic acid (i.e. 0.75 weight %) and a pH of 3.1 is disclosed.

These are all of the limitations set forth in claims 1-4, 7-10 of the applicant's invention. Regarding claims 11-14, the claimed selectivity ratios are properties that are presumed to be inherent to the slurry of Shemo et al. because Shemo et al. have the same compositions as claimed in claims 1, 7, 10 and, accordingly, these compositions must have the same properties (see MPEP section 2112.01).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 15-16, 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Juengling et al. (US 6,060,783) in view of Shemo et al. (US 6,328,774 B1).

Referring to Figs. 2-6 and column 1, line 59 to column 3, line 20, Juengling et al. disclose a prior art method for gate/wordline stacks that include the following features:

- The stacks include polysilicon lines (24a, 24b, 24c) and nitride caps (27a, 27b, 27c);
- The stacks have nitride sidewall spacers (28) and are covered with an interlayer of BPSG (30);
- Contact openings to silicon substrate (10) are formed in the BPSG layer (30) as shown in Fig. 4; and
- The contact openings are filled with doped polysilicon (44, 46, 48) and can be polished back by CMP until the nitride cap (31) is exposed as shown in Fig. 6.

These are limitations set forth in claims 15-16, 19 of the applicant's invention.

However, Juengling et al. lack the limitations set forth in claim 1 of the applicant's invention, which are directed to a CMP slurry composition and are also limitations of claim 15.

Shemo et al. disclose an aqueous polishing composition with abrasive that includes a periodate that can be periodic acid (HIO_4) and a buffer component to adjust the pH to be within a preferred range of 2 to 5 (see abstract and column 4, line 51 to column 9, line 49).

Therefore it would have been obvious to a person of ordinary skill in the art at the time the invention was made to combine the teachings of Juengling et al. and Shemo et al. in order to use the polishing composition of Shemo et al. for performing the CMP polish back step of Juengling et al. Shemo et al. recognize several advantages for using their polishing composition, including a high polishing rate and a low surface roughness (see column 9, lines 21-49).

5. Claims 17, 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Juengling et al. (US 6,060,783) and Shemo et al. (US 6,328,774 B1) as applied to claim 15 above, and further in view of Lin et al. (US 5,877,052).

As shown above, the combination of Juengling et al. and Shemo et al. has all of the limitations set forth in claim 15 of the applicant's invention. However this combination lacks the further limitation to claim 15 set forth in claim 17 of the applicant's invention, which is to pattern the word line by etching using carbon tetrachloride or chlorine gas. Also, this combination lacks the further limitation to claim 15 set forth in claim 21 of the applicant's invention, which is to use silane or disilane as the polysilicon source gas. Lin et al. teach that chlorine gas can be used for patterning a polysilicon gate (see column 4, lines 7-13). They also teach that silane or disilane can be used for depositing polysilicon by CVD (see column 3, lines 53-62).

Therefore it would have been obvious to a person of ordinary skill in the art at the time the invention was made to combine the teachings of Juengling et al., Shemo et al., and Lin et al. in order to deposit a polysilicon layer using silane or disilane as the source gas and using chlorine gas as an etchant to pattern this polysilicon layer into a gate structure as taught by Lin et al. Lin et al. recognize that silane or disilane can be used as the silicon source gas for depositing polysilicon by LPCVD (see column 3, lines 53-62) and that chlorine gas can subsequently be used to etch the polysilicon into a gate structure by a conventional RIE process (see column 4, lines 7-13).

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6. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Juengling et al. (US 6,060,783) and Shemo et al. (US 6,328,774 B1) as applied to claim 15 above, and further in view of Clampitt (US 5,994,232).

As shown above, the combination of Juengling et al. and Shemo et al. has all of the limitations set forth in claim 15 of the applicant's invention. However this combination lacks the further limitation to claim 15 set forth in claim 18 of the applicant's invention, which is to use TEOS or silane as a source material for forming oxide spacers. Clampitt teaches that wordline spacers can be formed using TEOS (see column 4, lines 47-64).

Therefore it would have been obvious to a person of ordinary skill in the art at the time the invention was made to combine the teachings of Juengling et al., Shemo et al., and Clampitt in order to form the spacers using TEOS as taught by Clampitt. Clampitt recognizes that TEOS-based spacers are known in the art (see column 4, lines 61-64).

7. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Juengling et al. (US 6,060,783) and Shemo et al. (US 6,328,774 B1) as applied to claim 15 above, and further in view of Jeng et al. (US 6,033,962).

As shown above, the combination of Juengling et al. and Shemo et al. has all of the limitations set forth in claim 15 of the applicant's invention. However this combination lacks the further limitation to claim 15 set forth in claim 20 of the applicant's invention, which is to form the contact hole using C_4F_8 , C_2F_6 , or C_3F_8 as an etching gas.

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Jeng et al. teach the formation of contact openings in BPSG using an etchant that includes C_4F_8 . (see column 4, lines 38-58).

Therefore it would have been obvious to a person of ordinary skill in the art at the time the invention was made to combine the teachings of Juengling et al., Shemo et al., and Jeng et al. in order to etch BPSG using C_4F_8 as taught by Jeng et al. Jeng et al. recognize that their etchant chemistry is highly selective to BPSG with respect to silicon nitride, which allows for overetching to completely remove BPSG from the contact opening (see column 4, lines 43-48).

8. Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Juengling et al. (US 6,060,783) and Shemo et al. (US 6,328,774 B1) as applied to claim 15 above, and further in view of Curry, II (US 5,142,828).

As shown above, the combination of Juengling et al. and Shemo et al. has all of the limitations set forth in claim 15 of the applicant's invention. However this combination lacks the further limitation to claim 15 set forth in claim 22 of the applicant's invention, which is to use a hard pad for the CMP step. Curry, II teaches that hard pads may be used for CMP (see column 3, lines 36-66).

Therefore it would have been obvious to a person of ordinary skill in the art at the time the invention was made to combine the teachings of Juengling et al., Shemo et al., and Curry, II in order use a hard pad as taught by Curry, II for CMP polishing. Curry, II recognizes that hard pads offer the advantages of faster polishing and a more planar finish (see column 3, lines 46-50).

Response to Arguments

9. Applicant's arguments with respect to claims 1-4, 7-22 have been considered but are moot in view of the new grounds of rejection.

Conclusion

10. Applicant's amendment necessitated the new grounds of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

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11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen W. Smoot whose telephone number is 571-272-1698. The examiner can normally be reached on M-F (8:00 am to 4:30 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr. can be reached on 571-272-1702. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SWS

Stephen W. Smoot
Patent Examiner
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